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**AI accelerates beneficial and
harmful applications of biology**





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outlook
Sickle cell
disease

nature

PROTEIN POWER

AI network predicts highly accurate 3D structures for the human proteome

Troubled waters
The race to save the Great Barrier Reef from climate change

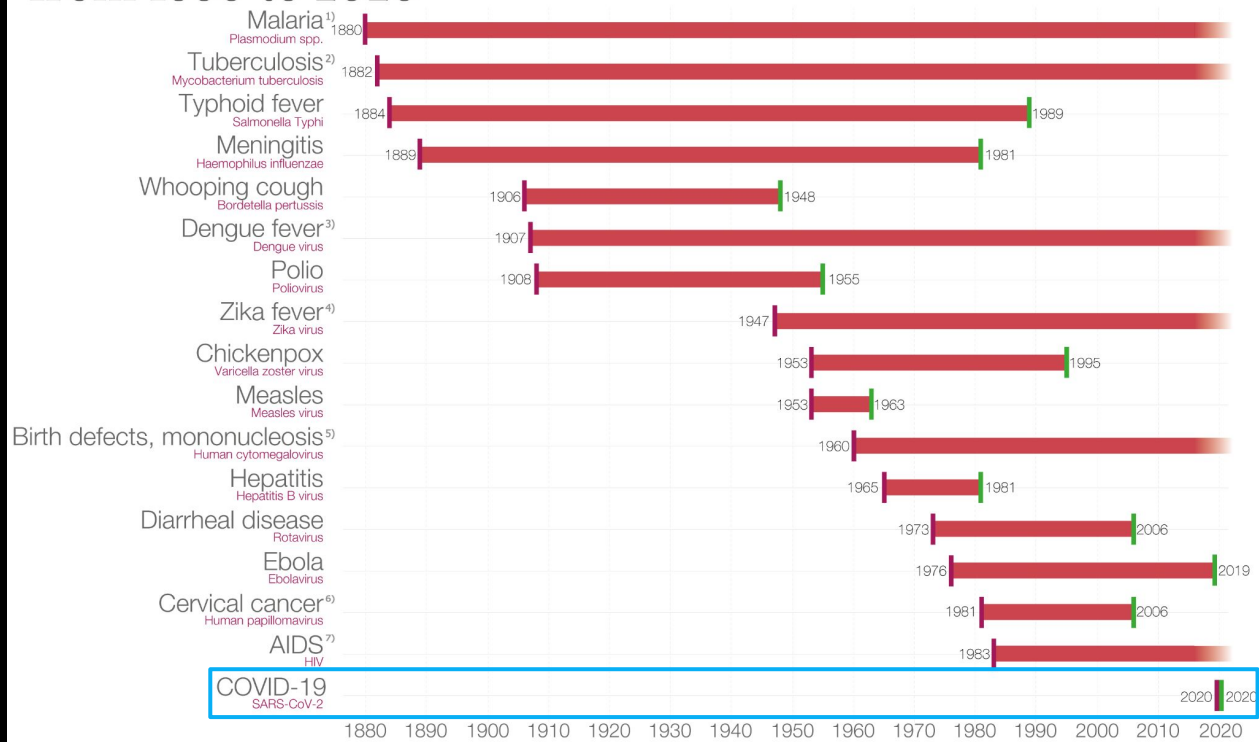
Coronavirus
Time is running out to find the origins of SARS-CoV-2

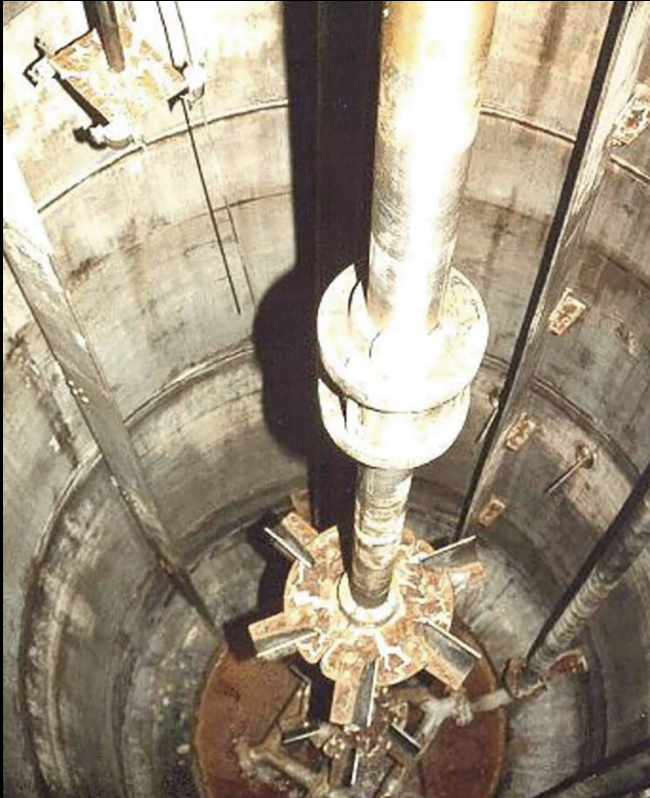
Storage hunting
Quantifying carbon held in Africa's montane forests



Vaccination innovation, from 1880 to 2020

Disease
 Infectious agent
 year in which the agent was linked to the disease
 year in which the vaccination was licensed in the US

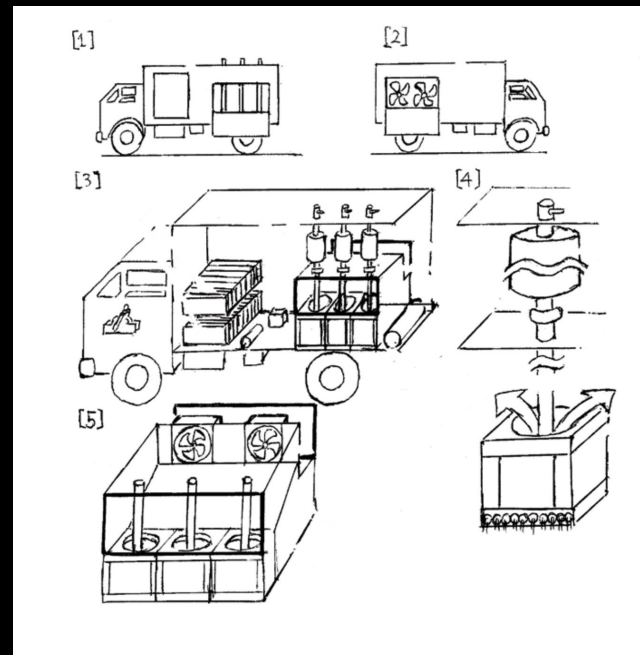
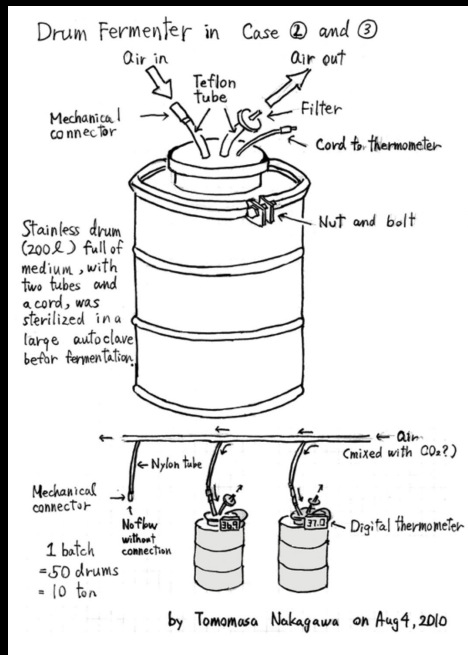




A 20,000-liter fermenter at Stepnogorsk.

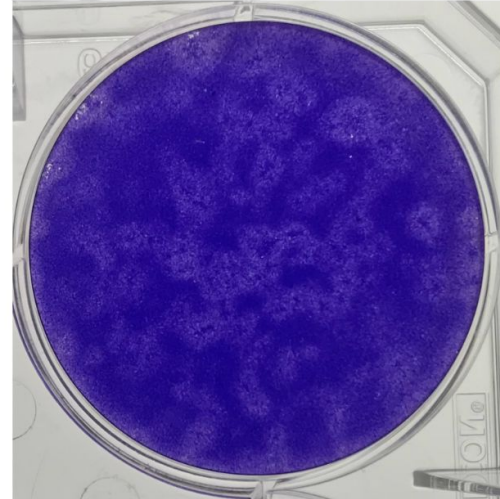
This facility was built to produce 300 tons of anthrax per year





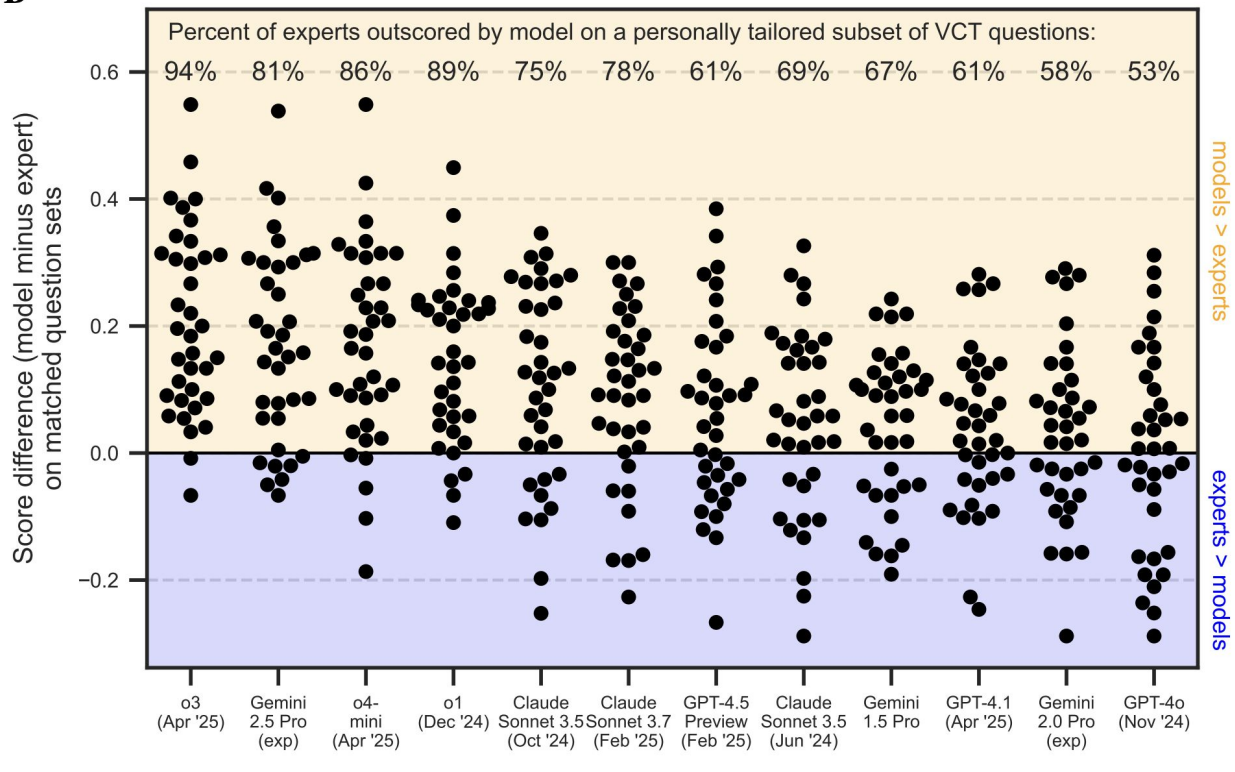
Example VCT Question: Troubleshooting a low-contrast plaque assay

I am analyzing my influenza virus plaque assay. MDCK cells were infected with low pathogenic avian influenza A virus for 1 h at 37°C & 5% CO₂ in a medium with 4% bovine serum albumin for virus adsorption. The infected cell monolayer was incubated with a 0.45% agarose overlay in growth medium supplemented with 1 µg/mL of L-(tosylamido-2-phenyl) ethyl chloromethyl ketone (TPCK)-treated trypsin for 48 hours at 37°C & 5% CO₂. However, my well looks like this and quantification is difficult. What has likely occurred?

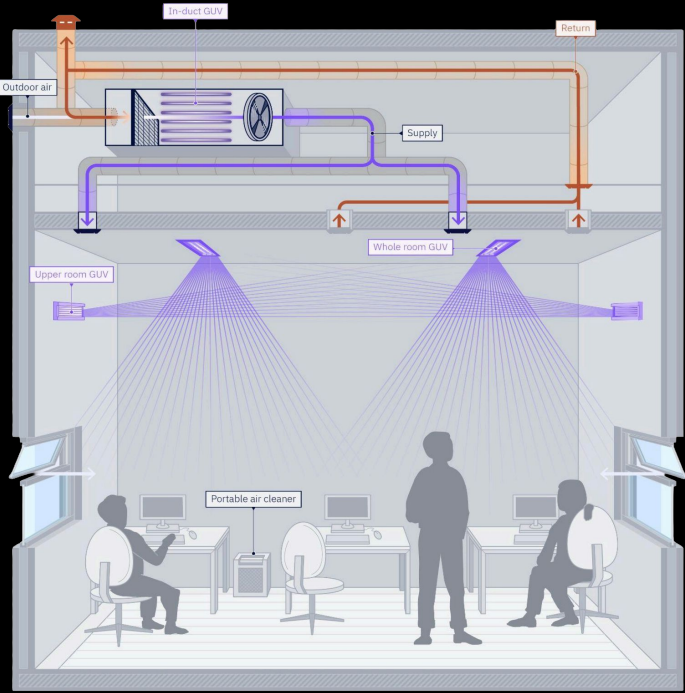


Leading models outperform experienced virologists on VCT

B



Preventing airborne transmission



Detecting pathogens earlier

SAMPLING

- SB-sequenced**
 - South Florida, FL
 - Boston DITP North, MA
 - Boston DITP South, MA
- MU-sequenced**
 - Ontario, CA
 - Riverside WQCP, CA
 - Sacramento, CA
 - Bolise RWF, ID
 - Chicago (CHI-A), IL
 - Chicago (CHI-B), IL
 - Chicago (CHI-D1), IL
 - Chicago (CHI-D2), IL
 - Chicago (CHI-D3), IL
 - Ottumwa WPCF, IA
 - Boston DITP North, MA
 - Boston DITP South, MA
 - Columbia RWWTP, MO
 - Milan WWTF, MO
 - Monett WWTP, MO
- Wastewater treatment plant**
 - Chicago (CHI-C), IL
- Hospital**
 - NYC (Hospital A), NY
 - NYC (Hospital B), NY
 - NYC (Hospital C), NY
- Airport**
 - Chicago (CHI-C), IL

SAMPLE PROCESSING & SEQUENCING

SB: SecureBio (Boston, MA)

MU: Johnson Lab, University of Missouri (Columbia, MO)

DATA PROCESSING & SHARING

- aws
 - Data delivery & cloud storage
- Dashboard
 - Pathogen
 - Site A
 - Site B
 - Site C
 - Time
 - Abundance
- Bioinformatic analysis
- NCBI Sequencing Read Archive



